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Preventive maintenance of historical buildings in European countries – analysis of selected examples

Introduction

The lack of sufficient interest among preservationists in the preventive protection of historic architecture can be explained by the complexity of calculations and analyses within a single discipline and the need for an interdisciplinary approach. Andrzej Tomaszewski, a great advocate of this type of activity, perhaps most aptly commented on the problem, noting that preventive protection is […] *so difficult with regard to architectural monuments and their complexes that the problem is generally not raised* [1, p. 264].

The three basic principles of preventive protection formulated for the conservation of museum collections, such as not interfering with the historic substance, securing the optimal microclimate of the surroundings and ensuring continuous monitoring of the condition of the monument, are most often realized in the case of the protection of architectural monuments only with regard to monitoring. Modifications to historic buildings are inevitable, as their use requires adaptation to new functional needs and to current building regulations. It is also necessary to ensure stable and optimal environmental conditions for immovable heritage.

In addition to climatic disasters – which have recently become increasingly frequent in previously unthreatened areas – there are such factors as intensive urbanization, environmental pollution, overpopulation, etc. All this has a destructive effect on the state of preservation of the historic substance, and it is only possible to regulate the strength of the impact of the risk factors of loss of historic values to a very limited extent.

The article is the result of the author's research on the analysis of the risk of losing the historic value of historic buildings. Most researchers agree with the statement that the optimal method of protecting architectural monuments is preventive conservation. Nevertheless, in practice (especially in Poland), the risk of threats to a building is rarely studied, and consequently, buildings are not protected in advance against potential dangers.

Preventive protection of architectural monuments as a method of conservation has only recently begun to form its own set of rules of conduct and a description of techniques and tools to slow down the natural process of destruction of the historic substance.

The purpose of the presentation of selected examples of practical solutions already used in an increasing number of European countries is to draw attention of the Polish conservation community and owners and managers of historic buildings to the need to change the current approach to the strategy of managing historic buildings. This is because the individual works necessary for preventive conservation can be properly planned and carried out in stages, which not only results in better protection of the monument, but is also associated with much lower financial outlays than in the case of repair of damage following an attack of threat factors.

Definition of the concept and state of research

It is widely accepted that preventive conservation is any measure that prevents damage or reduces the possibility of its occurrence. In the scientific literature, the definition of preventive conservation for architectural heritage is still in its formative stages. According to Koenraad van Balen – director of the UNESCO Chair for Preventive Conservation – inspiration for it should be sought in medicine [2, p. 100]. Preventive conservation is complementary to typical conservation work, and both should be integrat-

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ed into a system for promoting and supporting "heritage health". This approach guarantees better results, lower maintenance costs for the monument and increased public involvement in the preservation process. Stefano della Torre, an international expert in the field of conservation of architectural monuments, defines the concept as […] *a set of actions useful for reducing risk situations concerning cultural assets in their context* [3, p. 112]. The author follows the definition in Italy's most recent preservation law, from 2004. Most researchers agree that, regardless of the definition, the essence of this type of preservation lies in the application of the least destructive intervention to the building, thanks to the identification, assessment, analysis of the state of preservation, value and potential risks threatening the monument carried out beforehand, and the regular monitoring of the building and its surroundings. The goal of these interventions is to properly implement a restoration program and to safeguard against potential damage from identified risk factors.

The thought of protecting cultural heritage from degradation and destruction in order to save it for posterity has accompanied people for a long time. Many historical treatises, manuals and regulations on the protection of buildings and works of art from fire, water, earthquakes or insects have been preserved. We can learn about the history of preventive conservation through several publications by Simon Lambert [4], Jane Henderson [5], or the excellent monograph *Historical Perspectives on Preventive Conservation*, published by the Getty Institute in 2013 [6]. Modern research into preventive conservation of museum collections began in the 1960s. Among the many publications on the subject is the 2011 monograph *Preventive Conservation in Museum*, which presents a holistic approach to various ideas and concepts, including issues related to risk analysis and various methods used in conservation practice to ensure the best possible conditions for preserving exhibits [7]. At the same time, it is worth noting that research on preventive conservation of architectural heritage has been conducted for a short time.

The first attempts to directly transfer the principles of preventive conservation from the protection of collections to the protection of buildings failed. The simple principle of assessing the risk of potentially endangering collections (the ABC method) proposed by museum professionals, based on assigning a point value to each type of hazard risk [8], did not work at all for historic buildings. Difficulties in assessing the vulnerability of historic buildings to environmental and human-induced hazards are due to the complexity of the architectural monument, that is, its form, construction, materials used, and the state of preservation of these elements. In addition to this, the already implemented strategies for the care and protection of a given building have a major impact. The new approach to risk assessment for architectural heritage requires not only knowledge of the history of the monuments, but also an assessment of the potential hazards present for the site and the degree of vulnerability of the building to those hazards. The new methods of identifying and evaluating the data collected are supported by modern hardware and computer programs that use a matrix of relationships between the probability of occurrence of an identified hazard, the vulnerability of the building under study and the potential impact area of a given hazard. Among articles discussing various methods and methodologies, two are worth recommending: *A holistic and systematic assessment of maintenance approaches in heritage sites* [9] and *Risk assessment and risk management: Review of recent advances on their foundation* [10]. In view of the development of increasingly specialized diagnostic knowledge, the need has arisen to create guides available to non-professionals to support public education on the practical implementation of preventive conservation principles in historic buildings [11], [12]. Many scientific studies published in recent years have focused on the prevention of damage caused by environmental hazards [13]. However, man-made hazards should not be underestimated, especially in the context of recent terrorist attacks, such as in Syria, or the war in Ukraine [14]. Most researchers of this type of issue focus on analysing the damage caused by such events and how to repair it, ignoring the issue of securing buildings in advance in case of similar actions [15].

The selection of literature given earlier is only an outline of the characteristics of research on preventive conservation of architectural monuments. The selected publications focus on research related to the search for the most effective methods of protecting a building from various threats. This extension of the typical approach to the analysis of the state of preservation of the building substance to the study of the vulnerability of the object to various types of threats is a novelty of recent years, which has not yet fully reached Poland. Hence, in the Polish-language literature, within the framework of items addressing the problem of preventive conservation in the context of architecture, one can find mainly items discussing various diagnostic methods of the state of preservation of buildings, and threats are analysed primarily in terms of the possibility of intervening in the building substance, so mainly in terms of structural maintenance or ways of ongoing maintenance of monuments. The concept of "preventive conservation of the environment", created in Poland by Tomaszewski, was supposed to refer to the ability to secure tangible cultural heritage from destruction and unjustified interference with its structure. The professor emphasized that securing this heritage involves not only protecting a specific monument, but also its surroundings, and therefore the environment, which has an impact on the state of preservation of the object. Polish conservators of historical monuments took up the Professor's initiative, organizing, after his death, a series of conferences under the common title "Preventive Conservation of the Environment" and putting into practice the philosophy contained in four points: 1) creation of optimal conditions for the survival of the authentic substance of the building; 2) material integrity of the authentic; 3) monitoring of the condition of the monument; 4) minimalist intervention in the event of an emerging danger [16]. Polish preservationist thought focuses on the problem of preserving the authentic substance of the monument, while researchers from other countries place more emphasis on activities related to securing the monument from the negative im-

pact of threat factors and with ways to weaken the threat itself [17]. In the area of preventive measures for historic buildings, the necessity of taking care of the daily maintenance of the building in good condition and proper public education, building people's attachment to historic values is also emphasized [18]. There is also lack of publications on the Polish market explaining how to take care of one's own monuments, and the literature intended for owners of historic buildings. In many European countries, one can find practical guides available online that contain information on how to perform simple works to protect historic building elements [19].

Preventive maintenance in practice – pilot European initiatives

Despite the recognition that proactive preventive conservation is the best way to protect historic buildings, it is very rarely used in practice. Therefore, it is worth mentioning a few examples that can form the basis of a universal model for implementing such measures throughout Europe.

Stichting Monumentenwacht (Netherlands)

The Monumentenwacht Foundation of the Netherlands was established in 1973 by a group of Dutch owners of historic buildings to provide substantive and financial support for the preservation of their historic properties [20]. As part of a subscription fee, all members of this organization receive a preservation inspection report each year on the state of preservation of the building, along with an indication of potential risks that threaten to diminish its historic value. The inspections mainly concern the exterior of the building. The report takes the form of a checklist with a separate space for comments. The text is supplemented by photos of all weakened parts of the building and a plan of the roof. Regular inspection makes it possible to monitor the progress of natural degradation of the building material, so that owners can plan in advance for the renovation of the building – organize an appropriate repair team and apply for a government grant. Under the 1988 Dutch Law on the Protection of Monuments, the law allows state subsidies for the maintenance of private monuments, provided that regular inspections of their state of preservation are carried out and ongoing repairs are made.

The main disadvantage of this type of activity is the discrepancy between the subscription fee and the quality of the inspections carried out. In the absence of high-end instrumentation used for diagnostics, the quality of the inspection carried out depends on the professional experience of the inspector. In a standard inspection, only the exterior walls and roof of a building are checked, while the cause of many problems often lies inside (such as a plumbing failure) or in the foundations. In addition, there is no guarantee that the next year's inspection will be carried out by the same inspector, which means that his knowledge built only on the basis of the predecessor's photos and notes may not reflect the actual progress of degradation of the building substance. For this reason, the preventive measures proposed by inspectors may be too general in nature.

Monumentenwacht Vlaanderen (Belgium)

Belgium has an organization similar to that in the Netherlands, but of a slightly different nature [21]. It is formed by six institutions that support the implementation of the government's conservation policy. As a non-profit entity, it is entirely funded by the government of the Flemish Region. As in the Netherlands, private owners of monuments can take advantage of hefty subsidies combined with tax reliefs, provided their building is covered by regular preventive care. An inspection of the entire building is carried out every two to three years by an interdisciplinary team of inspectors from Monumentenwacht, who prepare a report that includes:

– an assessment of the state of preservation of the building with a detailed description of the damage found,

– a preventive conservation assessment of the scope and level of care carried out by the owner, based on observation and interview,

– environmental monitoring for measuring environmental risk factors (e.g., exposure to light, pests and climatic conditions),

– a risk assessment with listed potential conservation risk factors.

The main problem signalled by the parties involved in this initiative is the lack of a transparent methodology for assessing building risks. So far, the methodology used allowed the calculation of risks using the results of material vulnerability analyses, the nature of the identified hazard, the determination of the magnitude of potential losses in the value of the building, and the calculation of the approximate cost of necessary repairs along with a schedule of works. Risk assessments were often too subjective and analyses incomplete. Thanks to government support recently injected into the budget of this organization, the MAKS database and MAKSbo application were created to allow comparison of data from across the region, as well as easy insight into applied solutions to problems diagnosed in a building (e.g., drainage systems, window structures, trusses, etc.) [22].

Raadvad Bygingssyn Center (Denmark)

Building Supervision in Bygingssyn, which is a non-governmental organization that has been operating since 2000, brings together (as in Flanders) a group of specialists for the preventive conservation of architectural monuments. As part of the annual subscription, owners of monuments are entitled to an annual inspection to determine the state of preservation of the building. The inspection is based on an external inspection of the walls and roof. The examination is expanded to include a diagnosis of the condition of the basement and roof trusses. One consultation on how to maintain the building on an ongoing basis is also possible [23]. If some damage to the building is discovered during the inspection, the inspectors can repair or temporarily secure it, but already for an additional fee.

The organization is not subsidized by the government, hence its activities are financed additionally through orders for repairs made to facilities.

Its members also train construction craftsmen at the Nordisk Center til Bevarelse af Håndvaerk, which specializes in developing knowledge of traditional building materials, techniques and technologies. Course students do their apprenticeship at the owners' facilities under the supervision of supervisory members, using the Center's modern diagnostic equipment. Specialists can also provide assistance to those owners of historic buildings who have not decided to purchase a subscription. Inspectors provide advice by conducting free telephone consultations. For an additional fee, advice can be requested in the field. On its website you can download for free a number of guides detailing basic solutions to common problems faced by owners of historic buildings. As part of the annual subscription, the amount of which depends on the size of the house, owners are also offered a draft plan for the preservation of the building with a proposal to spread the work over five years, as well as technical instructions on how to perform the preservation work correctly. This allows owners to prepare financially and time-wise for needed repairs, vetting construction teams for price and quality of services performed.

Heritage Care (Spain, Portugal, southern France)

This is a very different initiative from those presented above. It builds on the potential of the international Interreg Sudoe research project, which was created in 2015 to support the regional development of southwestern Europe. Participants in the project worked on the development of a new methodology for preventive protection activities for architectural monuments from Portugal, Spain and the southern part of France [24]. The international specialists prepared a relevant database from the designated area of action, which enables the creation of specific guidelines for the efficient management of monuments. The developed common method of identifying the causes of damage, thanks to the easy exchange of information within the system, makes it possible to choose the optimal method of protection, individually tailored to the nature of the building, and to assess the risk of further damage due to various hazard factors. The organization offers inspections to monument owners at three different levels. The first (Standard Care) is a basic inspection performed as part of an annual subscription, which provides a report on the state of preservation of the building. The second (Plus Care) includes a set of extended non-invasive diagnostic tests, including geometric surveys. The classic report is enriched with a 3D model of the building with conservation problems plotted. The third level (Total Care) offers a complete digitalization of the building and its interior, full information on the state of preservation of the building's material and structure, along with registration of all risk factors and a plan of actions to reduce the risk of damage. The basic inspection provides the owner with a simple and quick diagnosis of the state of preservation of the building, and the damage detected in the inspection allows the owner to decide whether a more detailed inspection is warranted (Plus Care level) for an additional fee. This level, thanks to the use of advanced diagnostic techniques and computer applications (including the Microsoft HoloLens System), allows three-dimensional verification of proposed intervention solutions and enables the owner to more fully understand conservation problems.

Risk Maps (Italy)

The Italian initiative has a different specificity thanks to the full involvement of regional government agencies and the support of the EU funds. In 1990, the Central Institute for Restoration (Istituto Centrale per il Restauro) was created and for several years implemented the "Carta del Rischio" project, subsidized by the EU funds. The goal of the project was to create on a Geographic Information System (GIS) platform a database containing all sorts of information on the country's cultural heritage, environmental conditions taking into account the specifics of the regions, the tectonics of the terrain and the entire built environment, along with the country's technical infrastructure network. The graphical part was supplemented by detailed data on the history, nature and state of preservation of historic structures and other general information, including the number of people living in the buildings. The collected data was visualized on maps, which, thanks to the data integrated into the system, could indicate both the key factors of threats to monuments located in a given region and the places of necessary immediate interventions [25, p. 76]. These maps became an excellent tool for the implementation of planned preventive maintenance within the boards reporting to individual regional historic preservation offices across the country.

The implementation of the project has changed the government's preservation policy in Italy. In the new Heritage Code of 2004, the term "prevention" appeared, which means […] *a set of actions useful for reducing risk situations concerning cultural property in its context* [26, Art. 29]. Nowadays, owners of historic buildings can also apply for funding from the government for preventive maintenance work on the building. This unique initiative could only be organized with the cooperation of the government, as its implementation required a lot of money and advanced programming skills. Requiring ongoing additions, the map is available to everyone online. However, this excellent tool is used for monument preservation management only at the regional or municipal level. From the point of view of a private monument owner, such a map is too general. More detailed inspections and customized solutions are needed to create preventive maintenance guidelines for a specific site.

Importance of preventive conservation to protect heritage from threats

The material and structural resilience of a building and its protection against destructive hazards is one of the basic elements of preventive conservation. Studies of a building's vulnerability to various types of hazards have so far

focused around environmental analysis (e.g., floods, earthquakes, tsunamis, etc.) and mainly in areas where such phenomena occur frequently. In the face of skyrocketing climate change and the unbridled expansion of human civilization, modern heritage preservation must take on new challenges of prevention examining the impact of all threat factors, including terrorist acts and warfare. Only a proactive approach to safeguarding built heritage can ensure its prolonged existence.

Managers of architectural heritage must be adequately prepared even before a threat arises, by drawing up and implementing a plan to effectively manage risk readiness. This applies to private owners of monuments, as well as to regional conservation authorities that verify the level of heritage protection in their area. The need for prevention mechanisms for cultural heritage is highlighted by the UNESCO World Heritage Committee [27].

Preventive conservation also contributes to the activity of small specialized restoration companies and the reactivation of dying building crafts. Small orders, related to ongoing repairs, strengthen local craftsmanship and the overall "reuse" policy based on the use of indigenous materials and repair techniques.

Conclusions

Although preventive conservation is objectively more beneficial to a monument than reactive conservation (intervention after the destruction has been registered), this is not reflected in the current practice and policy of monument protection either in Poland or in other European countries. The examples presented above are singular, and the experiences are too poorly disseminated. Poland lacks an organization that advises owners of historic buildings on what and how to do to properly care for their property. National policies supporting preventive maintenance have been introduced only in Denmark, the Netherlands and Italy. While most institutions in other countries declare that preventive maintenance is a central part of their strategy, they do not even implement it in their own buildings. To the author's knowledge, none of the provincial preservation offices located in a historic building have commissioned a risk analysis for their own premises, reducing interventions to a response to the damage that has occurred.

The damage mitigation action plans proposed to owners in the examples presented above are now being implemented in many countries as part of the regulatory framework for conservation projects [28]. The primary purpose of such a plan is to emphasize the importance of the building through an assessment and analysis of preservation needs, which are drawn up on the basis of a field inspection.

The high cost of maintaining historic buildings is a common problem. Subsidies for the maintenance of such buildings are necessary to increase owners' interest in keeping buildings in good condition. In most European countries, however, such subsidies are given for major renovations or restoration of historic buildings, not for preventive conservation of the building [28]. Another factor complicating matters is the VAT, which discourages owners from systematic preventive conservation of the building. This paradoxical situation often leads to building deterioration and requires action at the government initiative level.

Most owners of historic buildings want to keep their property in the best possible condition, but approach preventive conservation with caution, not understanding its benefits. It is common to postpone cyclical maintenance work, and many people are also unaware of what they can replace or repair without obtaining official approval from preservation authorities and without having to engage highly specialized, and therefore expensive, preservation companies. The public needs better advice on the principles of building conservation philosophy that underlie the protection and care of historic buildings.

The current system of listing buildings as registered monuments imposes a duty of care only when changes to a building affect its historic values. Therefore, preservation authorities react only when they register a highlighted, significant deterioration of a building. This, unfortunately, increases the risk of demolition and de-listing of the monument, which is done from time to time in almost every European country.

A major problem is also the lack of specialized personnel capable of conducting maintenance inspections and risk assessments from selected hazards. Also to be added is the standard lack of modern diagnostic equipment and the ability to use various freely available computer applications to support the analysis needed to perform preventive conservation. Traditional demand for training in maintenance is virtually nonexistent, and vocational education in this field is essentially lacking. As Dann and Cantell note, for many building contractors […] *maintenance may be less interesting than remodeling and less attractive than major renovation of historic buildings* [28, p. 189].

More reasons can be given for the limited use of preventive conservation, the bulk of the arguments, however, come down to a matter of behavioural economics and the country's existing laws. Essentially, the method requires a change in the attitudes and habits of both monument owners and officials. Understanding what the term really means for historic preservation is the first stage in realizing the importance of the issue. The second stage is the need to incorporate its principles into practical action, as part of a modern strategy for the protection and care of monuments. This involves building a system of substantive and financial assistance to owners of historic buildings and subsidizing research into the still-forming methodology and tools that support non-invasive diagnosis of a building along with its environmental surroundings.

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Abstract

Preventive maintenance of historical buildings in European countries – analysis of selected examples

Architectural heritage, due to its material nature, is extremely sensitive to factors contributing to its degradation. Preventive conservation is currently the best way to protect the material authenticity of heritage and is well established in archaeology and museology. The protection of immovable heritage still lacks a proper understanding of this type of action.

The article presents a few selected examples of the application of such a method of historic preservation in Belgium, the Netherlands, Denmark, Italy and the region bordering France, Spain and Portugal. Several years of positive experience from such initiatives is reason enough to implement similar measures in Poland as well. Dissemination of knowledge of preemptive actions, which will allow the preparation of appropriate safeguards for the monument even before the threat occurs, is undoubtedly the most optimal solution. However, it is necessary to properly assist owners of monuments to provide them not only with additional funds for the ongoing maintenance of buildings, but also with a more complete and reliable knowledge about the vulnerability of a given building to various types of degradation. Modern historic preservation should replace the previous reactive approach with planned preventive maintenance.

Key words: preventive conservation, risk management, architectural monuments, historic buildings

Streszczenie

Konserwacja prewencyjna budynków historycznych w krajach europejskich − analiza wybranych przykładów

Dziedzictwo architektoniczne, ze względu na swój materialny charakter, jest niezmiernie wrażliwe na czynniki przyczyniające się do jego degradacji. Konserwacja prewencyjna jest obecnie najlepszym sposobem ochrony materialnej autentyczności dziedzictwa i ma swą ugruntowaną pozycję w archeologii i muzeologii. W ochronie dziedzictwa nieruchomego wciąż jeszcze brakuje właściwego zrozumienia dla tego typu działań.

W artykule zaprezentowano kilka wybranych przykładów zastosowania takiej metody ochrony zabytków w Belgii, Holandii, Danii, Włoszech oraz w regionie leżącym na pograniczu Francji, Hiszpanii i Portugalii. Kilkanaście lat pozytywnych doświadczeń płynących z tego typu inicjatyw jest wystarczającym powodem, aby podobne działania wdrożyć również i w Polsce. Upowszechnienie wiedzy na temat działań prewentywnych, które jeszcze przed wystąpieniem zagrożenia pozwolą na przygotowanie odpowiednich zabezpieczeń zabytku, są niewątpliwie najbardziej optymalnym rozwiązaniem. Konieczne jest jednak odpowiednie wspomożenie właścicieli zabytków, aby zapewnić im nie tylko dodatkowe fundusze na bieżącą konserwację budynków, ale także pełniejszą i rzetelniejszą wiedzę o podatności budynku na różne typy degradacji. W nowoczesnej ochronie zabytków powinno się zamienić dotychczasowe reakcyjne działania na planową konserwację prewencyjną.

Słowa kluczowe: konserwacja prewentywna, zarządzanie ryzykiem, zabytki architektury, budynki historyczne